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Transport Adaptation, Resilience and Decarbonisation in Small Island Developing States



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Key findings



Context and key challenges

- Because of their limited land area and geographic location and isolation, small island developing states (SIDS) are highly vulnerable to the impacts of climate change, and the resilience of transport infrastructure and services is closely tied to the resilience of SIDS communities.
- SIDS have experienced increasing incidences of climate change-related events such as tropical cyclones, storm surges, droughts, changing precipitation patterns, coral bleaching and invasive species.
- SIDS are highly dependent on fossil fuels for their transport systems, which contributes to greenhouse gas emissions and environmental degradation and undermines the resilience of countries to climate change impacts, such as sea-level rise and extreme weather events.
- Addressing transport access, decarbonisation, resilience and adaptation pathways in SIDS is crucial for achieving sustainable social, economic and environmental development and resilience.

Demand trends

- SIDS are highly dependent on maritime and air transport, although road transport is the dominant transport mode in terms of fuel use.
- The often small and dispersed nature of island communities leads to high transport costs and limited access to markets and services; meanwhile, transport infrastructure is often in poor condition and subject to the “build-neglect-rebuild” paradigm.
- Despite having strong renewable energy potential, SIDS remain highly dependent on fossil fuels for electricity and transport; fossil fuels accounted for 22.7% of total imports in 2019, and electricity costs in SIDS are among the world’s highest.
- The average motorisation rate across SIDS is an estimated 121 vehicles per 1,000 people. As elsewhere, car dependency often results from automobile-centric urban design and limited policy incentives for other forms of transport, while SIDS have the additional issue of inexpensive second-hand imported vehicles.
- Electric cars may not be economically or environmentally feasible in SIDS in the near term for a variety of reasons, and other decarbonisation measures could be prioritised instead, such as cycling and micromobility. Still, electric vehicle uptake is on the rise in some SIDS, notably in the Caribbean islands, and in some cases the vehicles are being charged with renewable energy.
- Some SIDS have been identified as key sources for raw materials needed in global supply chains to produce electric vehicles, leading to controversy in some cases.

Emission trends

- Despite rising emissions within SIDS, together these countries represented just 1% of global carbon dioxide (CO₂) emissions in 2019, yet they disproportionately experience the effects of climate change.
- SIDS contributed just 0.5% of global transport CO₂ emissions in 2021 (excluding international aviation and shipping), despite their emissions growing 9.6% during 2010-2021.
- in 2020, transport CO₂ emissions in SIDS fell 10% to 31.2 million tonnes, due to the impacts of the COVID-19 pandemic.
- Per capita transport CO₂ emissions in SIDS vary from 0.07 tonnes in Guinea Bissau to 4.96 tonnes in Seychelles.

Policy measures

- For many SIDS, land transport accounts for the bulk of imported fuel use, followed by electricity generation and maritime transport. Thus, phasing out fossil fuels in these sectors is the main lever for both reducing emissions and increasing energy security.
- Strategies identified for SIDS to decarbonise transport are largely similar to those for decarbonising urban and land transport systems in other regions. However, strategies in SIDS also must include integrated planning for inter-island transport, greening of ports and maritime and aviation operations, use of small boats for coastal travel, a regional approach to aviation services, and adoption of low-emission aviation and shipping technology.
- SIDS have implemented a wide range of measures to enhance the resilience of their transport sectors, from systems planning and risk-based asset management systems to smartphone apps.
- Some SIDS have increased their efforts to decarbonise shipping while also pushing for greater ambition globally.
- Many SIDS have led the charge on efforts to increase climate equity, address loss and damage from the effects of climate change, and restructure financial systems.

Overview



Small island developing states (SIDS) are a group of 37 United Nations (UN) Member Statesⁱ and 20 non-UN Members / Associate Members located in the Atlantic, Indian, and Pacific oceans and in the Caribbean, Mediterranean and South China seas. Despite their diverse cultures and histories, their common characteristics mean that they share many of the same challenges.¹

Because of their limited land area and geographic location and isolation, SIDS are highly vulnerable to the impacts of climate change.² This places them at a distinct disadvantage compared with larger nations, making the approach to sustainable transport in SIDS somewhat different than in other contexts. **The resilience of transport infrastructure and services in SIDS is closely tied to the resilience of these communities.**³

SIDS have experienced increasing incidences of climate change-related events such as tropical cyclones, storm surges, droughts, changing precipitation patterns, coral bleaching and invasive species.⁴ Between 1970 and 2020, hazards related to weather, climate and water led to an estimated USD 153 billion in cumulative losses in SIDS.⁵ By comparison, the average gross domestic product (GDP) in these countries was USD 13.7 billion in 2020.⁶

The transport sector is a critical component of SIDS economies, facilitating trade, tourism and access to essential

goods and services. However, populations in some SIDS lack adequate access to roads and transport services. For example, the Rural Access Indexⁱⁱ has rated Pacific Island nations among the lowest in the Asia Pacific region for access to roads, with the Maldives having a particularly large number of people lacking access.⁷

SIDS are highly dependent on fossil fuels for their transport systems, which contributes to greenhouse gas emissions and environmental degradation and undermines the resilience of countries to climate change impacts.⁸ Extreme weather events, sea-level rise and coastal erosion can damage transport infrastructure such as airports, ports, and roads, leading to service disruptions and increased maintenance costs. For SIDS whose land lies only a few metres above sea level, projected sea-level rise represents a direct threat to their existence.⁹ This highlights the urgent need for the transport sector to play a role in tackling climate change through decarbonisation efforts.

Despite rising emissions in SIDS, these countries represent only a small share of global carbon dioxide (CO₂) emissions.¹⁰ However, they disproportionately experience the effects of climate change, leading to calls from SIDS and others for greater international climate finance to aid with mitigation and adaptation (see Box 1).¹¹ By 2019, SIDS collectively had access to only USD 1.5 billion of the USD 100 billion pledged in climate finance for developing countries.¹²

i SIDS UN Members are as follows (entries with an asterisk are also least-developed countries, LDCs): Antigua and Barbuda, Bahamas, Barbados, Belize, Cabo Verde, Comoros*, Cuba, Dominica, Dominican Republic, Fiji, Grenada, Guinea-Bissau*, Guyana, Haiti*, Jamaica, Kiribati*, Maldives, Marshall Islands, Federated States of Micronesia, Mauritius, Nauru, Palau, Papua New Guinea, Samoa, São Tomé and Príncipe*, Singapore, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Seychelles, Solomon Islands*, Suriname, Timor-Leste*, Tonga, Trinidad and Tobago, Tuvalu* and Vanuatu. See <https://www.un.org/ohrlts/content/list-sids>.

ii A World Bank index estimating the share of the rural population with access to roads within a two-kilometre walking distance.

Across the Pacific Islands, the lack of options and infrastructure for active transport (walking and cycling) has contributed to low rates of physical exercise.¹³ In 2014, these islands were home to 9 of the world's 10 most obese countries, with up to 95% of the adult population overweight in some countries.¹⁴

Addressing transport access, decarbonisation, resilience and adaptation pathways in SIDS is crucial for achieving sustainable social, economic and environmental development and resilience. At issue are both the resilience of transport and resilience *through* transport, given the sector's importance to SIDS economies. (See Section 1.2 *Transport Adaptation and Resilience*.)

SIDS have often led the call for greater climate ambition internationally and have set ambitious decarbonisation goals themselves. Many measures taken thus far have contributed to development in line with the UN Sustainable Development Goals (SDGs) that are most relevant to SIDS, promoting more equitable, healthy, green and resilient communities.¹⁵ With their unique transport demands and the urgency of policies and strategies around decarbonisation, resilience, and adaptation of the transport sector, it is helpful to focus on the special case of SIDS and their vulnerability to climate and sustainability challenges.

Demand trends

SIDS are highly dependent on maritime and air transport, although road transport is the dominant transport mode in terms of fuel use.¹⁶ Transport modes vary among SIDS depending on the country's size, location and main economic activities. In general, SIDS rely heavily on transport for tourism. For nearly two-thirds of SIDS, the tourism sector represents more than 20% of the gross domestic product (GDP), and this share reaches 58% in Palau and 65% in the Maldives, underscoring the importance of maintaining the sector's resilience.¹⁷ In the Maldives, tourism accounted for around 45% of total economic activity and for around 35% of all jobs in 2021.¹⁸

The often small and dispersed nature of island communities leads to high transport costs and limited access to markets and services; meanwhile, transport infrastructure is often in poor condition and subject to the "build-neglect-rebuild" paradigm.¹⁹ The reliance on fossil fuels for transport contributes to environmental degradation and undermines the resilience of SIDS to climate change impacts such as sea-level rise and extreme weather events.²⁰ In 2019, fossil fuel imports – mainly for electricity and transport – accounted for 22.7% of total imports among SIDS.²¹ Electricity costs in these countries are among the highest globally due to the high costs of transporting fuel.²²



Photo: Milos Bicanski / Climate Visuals

SIDS collectively accounted for 17.5% of ship registrations globally in 2020, just below the combined share for industrialised countries (21.6%); however, they experience low shipping connectivity, accounting for 29 of the 50 least-connected economies, according to a 2021 report.²³

For road transport, the average motorisation rate across SIDS is an estimated 121 vehicles per 1,000 people.²⁴ The rate ranges from 527 vehicles per 1,000 people in Saint Kitts and Nevis, to only 10 vehicles per 1,000 people in Papua New Guinea.²⁵ For comparison, the European Union (EU) averages 560 vehicles per 1,000 people.²⁶ **As elsewhere, car dependency in SIDS often results from automobile-centric urban design and limited policy incentives for other forms of transport, while SIDS have the additional issue of inexpensive second-hand imported vehicles.**²⁷

Traffic congestion has been increasing in several SIDS, in some cases leading to political tension.²⁸ While the traditional response to congestion globally is to add or widen roads (which, paradoxically, can lead to more traffic), this is not a viable option in SIDS, where land is scarce and financing can be challenging.²⁹ This has led some SIDS, such as Singapore, to develop or consider other solutions for congestion (see *Policy Developments section*).³⁰ The World Bank has proposed cycling support measures to help address congestion in the Pacific Islands – such as removing car parking, lowering speed limits, and adding segregated cycling lanes and bicycle parking – as well as demand management measures for private vehicles.³¹

A World Bank study found that electric cars may not be economically or environmentally feasible in SIDS in the near term for a variety of reasons, and that other decarbonisation measures could be prioritised instead.³² In SIDS, imports have increased of low-cost, high-emitting cars from markets that have already achieved high levels of fleet decarbonisation, and electric vehicles have higher upfront (import) costs and a small market size; meanwhile, the environmental benefits from electric vehicles are limited until further deployment of renewable energy occurs, since much of the electricity in SIDS comes from generators running on imported diesel fuel.³³ Still, **electric vehicle uptake is on the rise in some SIDS, notably in the Caribbean islands, and in some cases the vehicles are being charged with renewable energy.**

- ▶ Bermuda has been developing a strategy for transitioning to an all-electric public bus fleet.³⁴ By 2022, the country had electrified a third of its bus fleet, replacing 30 diesel-

powered buses with electric buses.³⁵ Bermuda also has committed to 85% renewable energy by 2035.³⁶

- ▶ Barbados has become a regional leader in electric vehicle deployment, with around 430 electric vehicles on the road by 2020; as of 2013, around 1.3% of new car sales in the country were electric (a greater share that year than in some high-income countries, such as Canada).³⁷
- ▶ Utilities in some SIDS, such as the Bahamas and Saint Lucia, were installing electric vehicle charging infrastructure as of 2019.³⁸

The World Bank has noted that the expansion of cycling and micromobilityⁱⁱ is an untapped opportunity in many SIDS, which tend to have compact settlements and often struggle to accommodate rising motorisation rates.³⁹ Several Pacific Islands have large populations that, by using cycling or micromobility, could easily reach locations within a five-kilometre radius in 20 minutes or less. Micromobility would be well-suited to the Pacific context but so far has lacked a concerted push from government and the private sector to begin the self-reinforcing cycle of uptake.⁴⁰

Although most of the electricity in SIDS remains fossil based, many of these countries have large potentials for renewable energy sources such as solar, wind, tidal, and ocean energy, and in some cases geothermal and hydropower.⁴¹ Greater local use of renewables has the potential to boost energy independence, increase energy security, and build resilience, while providing a clean energy source for electric vehicles. The installed renewable energy capacity in SIDS has grown from 3.5 gigawatts (GW) in 2014 to more than 6.5 GW in 2021, led by solar power and followed by hydropower, bioenergy, and wind power, with smaller amounts of geothermal and marine energy.⁴²

Some SIDS have been identified as key sources for raw materials needed in global supply chains to produce electric vehicles, leading to controversy in some cases.

- ▶ Tesla announced in 2021 that it would purchase nickel from a mine in New Caledonia, the fourth largest nickel producer globally.⁴³
- ▶ A controversial copper mine in Papua New Guinea was set to re-open following an agreement in 2022, despite widespread opposition and a decade-long conflict over the mine.⁴⁴
- ▶ Companies were active in resource mining in Fiji, which has had a pro-mining government.⁴⁵

i Connectivity includes, for example, the number of shipping lines servicing the country, the number of services connecting the country to others, and the number and capacity of vessels in the country. See endnote 23 for this section.

ii Including electric sidewalk/"kick" scooters, dockless electric and traditional bicycles, and electric moped-style scooters.

Emission trends

Despite rising emissions within SIDS, together these countries represented just 1% of global CO₂ emissions in 2019.⁴⁶ For transport specifically, SIDS contributed just 0.5% of global transport CO₂ emissions in 2021 (excluding international aviation and shipping).⁴⁷ Transport CO₂ emissions from SIDS grew 9.6% during 2010-2021.⁴⁸ In 2020, transport CO₂ emissions in SIDS fell 10% - from 34.7 million tonnes to 31.2 million tonnes - due to the impacts of the COVID-19 pandemic.⁴⁹ Per capita transport CO₂ emissions in SIDS vary from 0.07 tonnes in Guinea Bissau to 4.96 tonnes in Seychelles (see Figure 1).⁵⁰

Policy Developments

For many SIDS, land transport accounts for the bulk of imported fuel use, followed by electricity generation and maritime transport.⁵¹ Thus, phasing out fossil fuels in these sectors is the main lever for both reducing emissions and increasing energy security (through greater resilience to price spikes). Strategies identified for SIDS to decarbonise transport are largely similar to those for decarbonising urban

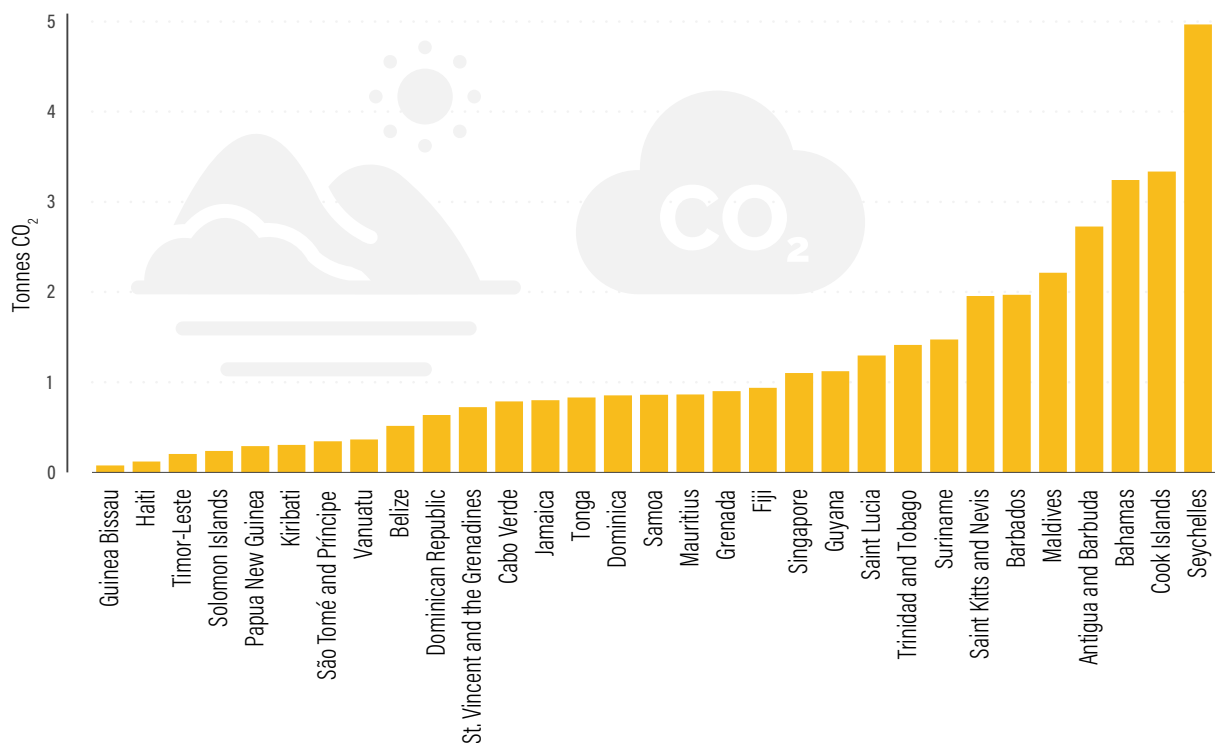
and land transport systems in other regions (see Section 3.1 Integrated Transport Planning).⁵² However, strategies in SIDS also must include integrated planning for inter-island transport, greening of ports and maritime and aviation operations, use of small boats for coastal travel, a regional approach to aviation services, and adoption of low-emission aviation and shipping technology.⁵³

SIDS have implemented a wide range of measures to enhance the resilience of their transport sectors.

- ▶ To reduce its vulnerability, Samoa pushed for a coherent and multi-pronged approach to systems planning, with the adoption of sectoral and spatial planning tools, investments in road network redundancy for critical infrastructure such as roads and bridges, the construction of pedestrian evacuation routes, and policies and planning that address disaster and climate risks.⁵⁴ Beginning in 2012, the Samoa Post Tsunami Reconstruction Project supported building the East Coast Inland Route and upgrading the Lepa-Lalomanu Route, both of which are inland routes that provide all-weather alternatives to coastal roads, helping to increase the resilience of communities to climate change.⁵⁵

FIGURE 1. Per capita transport CO₂ emissions in SIDS

Source: See endnote 50 for this chapter.



- ▶ In Dominica, the roadway network is prone to flooding and landslide hazards, and after Tropical Storm Erika hit the island in 2015 around 60% of the roads were inaccessible.⁵⁶ In 2016, a sustainable risk-based asset management system was implemented for roadway infrastructure, to keep track of reconstruction, continuously assess conditions, assess disaster vulnerability, and prepare a multi-year investment and mitigation action plan. The system also identifies optimal investment strategies to reduce the roadway's risk and vulnerability to hazards and to maintain its functionality at an acceptable level.⁵⁷
- ▶ In Saint Lucia, the Ministry of Infrastructure adopted a smartphone app, RoadLab Pro, as a low-budget and easy-to-use geo-mapping tool for assessing road conditions, including road roughness.⁵⁸

Some measures in SIDS also have supported decarbonising road transport:

- ▶ Although intended to address congestion, Singapore has implemented various measures since the 1970s that also support a lower-emission transport system. To manage the increasing number and use of vehicles, measures have included vehicle and fuel taxes, parking charges and a vehicle quota system.⁵⁹ In 1971, Singapore developed a mass rapid transit system to allow for island-wide connectivity without reliance on private vehicles, and recently it enacted a walking and cycling plan.⁶⁰
- ▶ In 2019, Bermuda set targets to reach 100% electrified public transport by 2030 and an 85% renewable share in the overall energy supply by 2035.⁶¹

- ▶ In Antigua and Barbuda, an electric vehicle pilot project was launched in 2017 with the donation of two electric school buses, which were integrated into the system at the start of the 2020 school term.⁶²

Some SIDS have increased their efforts to decarbonise shipping while also pushing for greater ambition globally:

- ▶ In 2020, the Marshall Islands set the objectives of reducing domestic shipping emissions 40% by 2030 and fully decarbonising the sector by 2050.⁶³
- ▶ The Marshall Islands, Kiribati and the Solomon Islands have been influential within the International Maritime Organization (IMO) in advocating for scaled-up ambition in decarbonising shipping.⁶⁴

Because SIDS face disproportionate impacts from climate change, many have led the charge on efforts to increase climate equity, address loss and damage from the effects of climate change, and restructure financial systems. For example, in 2022 Barbados adopted the Bridgetown Agenda as a call to the international community for greater financial support for developing countries affected by climate change (see Box 1).⁶⁵ In March 2023, six Pacific Island countries – Fiji, Niue, the Solomon Islands, Tonga, Tuvalu and Vanuatu – signed the Port Vila Call for a Just Transition to a Fossil Fuel Free Pacific, a call to action encompassing many measures to transition the region away from fossil fuels, including reforms to international climate finance to help enable the transition.⁶⁶

BOX 1. The Bridgetown Agenda for climate finance

In 2022, Barbados adopted the Bridgetown Agenda, calling on the International Monetary Fund, the World Bank, the G20 countries and others in the international community to increase financial support to low- and middle-income countries. The agenda is aimed at efforts to deal with climate change as a top crisis, alongside the cost of living and debt crises (which themselves have been exacerbated by climate-related disasters, the COVID-19 pandemic and the Russian Federation's war on Ukraine). The agenda outlined three actions:



- 1 Provide emergency liquidity to countries in need to stop the debt crisis.**
- 2 Expand multilateral lending by USD 1 trillion, placing a priority on achieving the SDGs and building climate resilience.**
- 3 Activate private sector savings for use in climate mitigation, as well as funding for reconstruction following climate-related disasters using new multilateral mechanisms.**

This initiative proved to be a significant development that has had implications for the UN international climate negotiation processes, including catalysing debate at the 2022 UN Climate Change Conference in Sharm El-Sheikh, Egypt (COP 27). It also resulted in the organisation of the first Global Supply Chains Forum, scheduled to be held in Barbados in May 2024, organised by the government of Barbados and the UN Conference on Trade and Development.

Source: See endnote 65 for this section.

In addition, outside governments and organisations have taken an interest in providing **international support** to SIDS on transport-related projects, typically with the aim of also reducing emissions.

- ▶ Germany's Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) has administered the Regional Pacific Nationally Determined Contribution Hub to support Pacific Island countries in reviewing, enhancing and implementing their climate commitments, including helping to identify opportunities to bring the transport sector to the fore and connect climate ambitions at the national and local levels.⁶⁷ This hub is implemented in partnership with the Global Green Growth Institute, the Pacific Community, and the Secretariat of the Pacific Regional Environment Programme, and served 14 member countries as of early 2023: Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Marshall Islands, Palau, Papua New Guinea, Nauru, Niue, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu.
- ▶ From 2017 to 2023, GIZ supported the Marshall Islands in reducing emissions and transitioning to energy efficient transport in the maritime sector through the Transitioning to Low Carbon Sea Transport project.⁶⁸
- ▶ The Global Green Growth Institute has supported the SIDS within its membership – Fiji, Kiribati, Papua New Guinea, Tonga and Vanuatu – in pursuing a low carbon development approach while also promoting increased resilience.⁶⁹
- ▶ Implemented by the IMO and funded by the EU, the Global Maritime Technology Cooperation Centre's (MTCC) Network Project was established in 2017 and extended to March 2022, with the objective of supporting least-developed countries and SIDS in particular to improve energy efficiency and decrease emissions in the shipping sector.⁷⁰
- ▶ The Pacific Centre for Renewable Energy and Energy Efficiency (PCREEE), supported by the United Nations Industrial Development Organization (UNIDO), has been working on standards and regulations for electric vehicles and e-micromobility in the Pacific Islands, following other work focused on exploring options for integrating electric mobility and renewable energy.⁷¹
- ▶ The International Renewable Energy Agency (IRENA) has supported SIDS in their efforts to transition from fossil fuel dependence to renewable energy through its SIDS Lighthouses Initiative.⁷² The initiative brings together a multi-stakeholder group of countries, regional and international organisations, development agencies, the private sector, research institutes and non-governmental organisations to support SIDS in this effort.⁷³
- ▶ For over 50 years, the US Department of State has supported Pacific Island countries through its Pacific Islands Forum across a range of issues, including sustainable growth, environmental challenges and natural disasters.⁷⁴ In 2022, the first ever US-Pacific Island Country Summit was held to increase co-operation on issues including climate change; it included the launch of the Pacific Partnership Strategy to support the Pacific Islands on dealing with such issues.⁷⁵



SPOTLIGHT 2 TRANSPORT ADAPTATION, RESILIENCE AND DECARBONISATION IN SMALL ISLAND DEVELOPING STATES

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